CLAIMS:

1.   An apparatus for comparing a test medical, multi-featured image of a tumor to a collection (204) of reference medical, multi-featured images of tumors determined to be malignant, or to a collection (204) of reference medical, multi-featured images of tumors determined to be non-malignant (112, 220), to identify ones of the reference images that are similar feature-wise to the test image, each of the features of the test and medical images having respective values, said apparatus comprising a processor (100) configured for designating one of the two collections, selecting reference images from the designated one to form respective groups of the selected images (208), applying a genetic algorithm to alter ones of the groups (228) and to determine which of the groups is at a minimum distance to the test image based on said values (216, 220).

2.   The apparatus of claim 1, wherein said selecting forms a set of said groups and wherein said applying iteratively derives (228), from groups of the set, based on distances from the test image to respective ones of the groups of the set and until a stopping criterion is met (224), new groups of the set.

3.   The apparatus of claim 2, said processor being configured to compute the distances as Mahalanobis distances (216).

4.   The apparatus of claim 2, said apparatus being configured to perform the iterative deriving by calculating, based on said values and for each of the groups for which a Mahalanobis distance has not already been calculated (216, 220), a Mahalanobis distance between the test image and that group, determining if a stopping criterion has been met and if the criterion has not been met (224), substituting, in at least one of said groups, for at least one of said selected images a different image in the designated collection (228) and repeating said calculating to start another iteration (216, 220).

5.   The apparatus of claim 4, said apparatus being configured for performing the steps of

        assigning to each of said images in the designated collection a respective number (204);

        selecting from among said numbers (208); and

        assembling bit strings representative of the selected numbers to form a plurality of composite bit strings corresponding to respective ones of said groups (212, 304, 308).

6.   The apparatus of claim 5, said processor being configured to change, in performing said substituting, at least one bit of at least one of the plural composite bit strings to form at least one additional composite bit string in a manner that does not change at least one bit string that served as a component in said assembling (312, 316).

7.   The apparatus of claim 5, wherein the assembling concatenates representative bit strings in forming the composite bit strings (304, 308)

8.   The apparatus of claim 5, wherein said substituting comprises selecting from among the composite bit strings and changing at least one bit of a selected one of the composite bit strings to form at least one additional composite bit string (228, 312, 316).

9.   The apparatus of claim 5, wherein said substituting comprises the step of swapping bits between a pair of the composite bit strings (404, 408, 412, 416).

10.   The apparatus of claim 5, wherein the substituting in said at least one of said groups comprises the step of choosing at least one of the reference images at random for said substituting (228).

11.   The apparatus of claim 1, said processor being configured to compute the distances as Mahalanobis distances (216).

12.   The apparatus of claim 1, comprising a random number generator for selecting at random in performing the selecting from among the reference images (208).

13.   A method for comparing a test medical, multi-featured image of a tumor to a collection (204) of reference medical, multi-featured images of tumors determined to be malignant, or to a collection (204) of reference medical, multi-featured images of tumors determined to be non-malignant (112, 220), to identify ones of the reference images that are similar feature-wise to the test image, each of the features of the test and medical images having respective values, said method comprising the steps of:

a) designating one of the two collections (204);

b) selecting reference images from the designated one to form respective groups of the selected images (208); and

c) applying a genetic algorithm to alter ones of the groups and to determine which of the groups is at a minimum distance to the test image based on said values (216, 220, 224, 228).

14.   The method of claim 13, wherein the distances are Mahalanobis distances (216).

15.   The method of claim 13, wherein the step b) forms a set of said groups (212) and wherein the step c) iteratively derives (228), from groups of the set, based on distances from the test image to respective ones of the groups of the set and until a stopping criterion is met (224), new groups of the set.

16.   The method of claim 13, further comprising the steps of:

assigning to each of said images in the designated collection a respective number (204);

selecting from among said numbers (208); and

assembling bit strings representative of the selected numbers to form a plurality of composite bit strings corresponding to respective ones of said groups (212, 304, 308).

17.   The method of claim 13, wherein the step c) further comprises the steps of:

d) calculating, based on said values and for each of the groups for which a Mahalanobis distance has not already been calculated, a Mahalanobis distance between the test image and that group (216, 220);

e) determining if a stopping criterion has been met (224); and

f) if the criterion has not been met, substituting, in at least one of said groups, for at least one of said selected reference images a different reference image in the designated collection (228), and returning to step d) (216).

18.   The method of claim 17, further comprising the steps of:

assigning to each of said images in the designated collection a respective number (204);

selecting from among said numbers (208); and

assembling bit strings representative of the selected numbers to form a plurality of composite bit strings corresponding to respective ones of said groups (212, 304, 308);

wherein said substituting in step f) comprises the step of changing at least one bit of at least one of the plural composite bit strings to form at least one additional composite bit string in a manner that does not change at least one bit string that served as a component in said assembling (312, 316).

19.   A computer program product having a computer-readable medium that contains a computer program executable by a processor (100), said program for comparing a test medical, multi-featured image of a tumor to a collection (204) of reference medical, multi-featured images of tumors determined to be malignant, or to a collection (204) of

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reference medical, multi-featured images of tumors determined to be non-malignant (112, 220), to identify ones of the reference images that are similar feature-wise to the test image, each of the features of the test and medical images having respective values, said program comprising:

a) a sequence of instructions for designating one of two collections (204);

b) a sequence of instructions for selecting reference images from the designated one to form respective groups of the selected images (208); and

c) a sequence of instructions for applying a genetic algorithm to alter ones of the groups and to determine which of the groups is at a minimum distance to the test image based on said values (216, 220, 224, 228).